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MEMORANDUM REPORT

on the

PHOTOGEOLOGIC EVALUATION

of the

OLD FORT RIVER AREA, ALBERTA

Accompanying maps is missing

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INTRODUCTION

The Old Fort River project covers about 900 square miles in northeastern Alberta. The area centers about Quartz Mineral Prospecting Permits nos. 82, 83, 84 and 85 held by National Nickel Ltd. The permit outlines are shown on the accompanying geologic map. The photogeologic study was undertaken as an initial step in the evaluation of the permits so as to guide future exploration. One of the objectives was to portray surface geology, outcrop areas, glacial features and any indication of structure. Accessibility considerations were also important to provide guidance for ground prospecting and examination of outcrops in the field. Vertical air photographs were acquired from the Provincial government at the approximate scale of 1 to 40,000. Prints of controlled torn-center air photomosaics were acquired from the government at the scale 1 inch to 1 mile. A photomosaic montage was prepared at the mosaic scale and co-ordinates of latitude and longitude and the outline of the permits were plotted on the mosaic. The air photographs were examined stereoscopically and the geologic interpretation was ink-drafted to a stable film overlay. The overlay was superimposed with the negative of the air photo-mosaic montage and printed together to provide the map super-imposed on the photomosaic.

References to literature are indicated by the author's name followed by the date of publication. A Selected Bibliography appears at the end of the report.

Accessibility

The Old Fort River area is difficult to reach using overland routes. The Fort Chipewyan area on Lake Athabasca can be reached by vehicle by way of the Northwest Territories. The distance may be cut when the road from Fort Vermilion through Wood Buffalo National Park is completed. The area can be reached using the Athabasca River water route from the Waterways area of Alberta. Numerous landing spots for fixed-wing aircraft are afforded at local marine landing sites on Lake Athabasca. Ground geologic and geophysical parties could best be transported into the permit area by helicopter. In addition to the exposures of bedrock along the south shore of Lake Athabasca, other exposures are anticipated in stream cuts in the Old Fort River valley. Other outcrops and possible outcrop areas could be examined most conveniently using a helicopter; the areas are indicated on the accompanying map.

GEOLOGIC SETTING

Physiography

The Old Fort River project lies in the Canadian Shield about 35 miles east of the Interior Plains. Lake Athabasca occupies the northern part of the area. It is a remnant of a more extensive proglacial lake that formed one of a series along the boundary between the Shield and the Interior Plains extending from the Great Lakes through the Lake Winnipeg - Lake Athabasca - Great Slave and Great Bear Lakes area.

The terrain consists of a gently rolling plain that slopes gradually to the north towards Lake Athabasca. Topographic elevations range from about 700 feet, the level of Lake Athabasca, to about 1,200 feet in low hills in the southern part of the project. However, much of the land stands at elevations between 900 and 1,000 feet. The Old Fort River is the principal drainage in the area and forms a small tributary to Lake Athabasca. The Old Fort River is incised 50 to 75 feet below the plain in places. Several small lakes are scattered over the area. A moderate low forest and scrub bush growth is present throughout the region.

Bedrock is formed by the Athabasca sandstone of Precambrian age. However, rock exposures are exceedingly sparse because bedrock is covered by a diverse variety of extensive surficial deposits. Some outcrops and possible outcrops were noted at places where the Old Fort River has incised into the plain. The locations of some field observed published outcrops are indicated on the accompanying map along the shore of Lake Athabasca. Some possible outcrop areas are indicated on hills that rise above the general level of the terrain although bedrock appears mantled by surficial deposits. These are present in Tp. 108, R.3, Tp. 111, R. 1, and Tp. 112, R. 1 W/4M.

The surficial deposits which are discussed in more detail under stratigraphy are Quaternary in age. They are mainly Recent lake deposits and a variety of Pleistocene glacial drift, including glacial outwash, ground moraine and run-off deposits. In addition, numerous glacial drumlins are present at a few scattered places. They indicate that the last glacial advance was toward to the southwest. In the southern part of the project eskers and associated glacio-fluvial deposits are present and tend to be aligned in a southwesterly orientation. A variety of sand dunes surmount portions of the area especially in the north.

Thus, the Old Fort River area is a gently rolling plain that had reached old age in the erosional cycle before being subjected to multiple continental glaciation during the Pleistocene Epoch. During deglaciation an extensive proglacial lake system formed which retreated to form the present limit of Lake Athabasca. The area has been reverted to the initial stage in the erosional cycle and is being moderately eroded by streams.

Stratigraphy

Examination of published geologic data indicates that bedrock throughout the Old Fort River area is formed by the Athabasca Formation of Proterozoic age. However, little is known of its lithology and local structure because bedrock is covered by extensive surficial deposits. Examination of published data indicates that regionally the Athabasca Formation consists of an interbedded sandstone, conglomerate and shale which unconformably overlie lower Proterozoic and Archean igneous metamorphic and sedimentary rocks. The Athabasca sandstone covers a vast area of northwestern Saskatchewan and a small part of northeastern Alberta. It is reported that the formation ranges in thickness from a thin edge to as much as 5,260 feet. However, it is anticipated that the Athabasca sandstone ranges in thickness from the eroded edge to 2,000 feet in the Old Fort River area.

A variety of surficial deposits of Quaternary age cover the Old Fort River area. A few patches of glacial drift surmounted by drumlins are present in the southern and central part. They are labelled Qdd on the evaluation map. Glacial drift is also present throughout the southern part of the report area and consists of ground moraine, glacial run-off deposits,

eskers and associated glacio-fluvial material and some outwash. These undifferentiated glacial deposits are mapped and labelled Qd on the accompanying map.

A northeasterly trending band of terrain extending from Tp. 110, R. 3, W/4M to the northeastern corner of the project consists of glacial drift and outwash deposits surmounted by windlown sand dunes. A variety of types are present. They include linear swarms, hairpins, barchanes, barbed dunes and some displaying an irregular pattern. This formation is labelled Qsd.

The central part of the Old Fort River area is occupied by an extensive outwash plain. These glacial deposits impart a relatively even surface and homogenous tone on air photographs. They are labelled Qo.

One of the youngest surficial deposits consists of Recent lake deposits of Lake Athabasca. They border the present shoreline. Evidence of an earlier higher shoreline of Lake Athabasca is indicated on the accompanying map. The area northwest of the former shoreline is underlain by these Recent lake deposits. At a few places some linear sand dunes surmount the lake deposits.

The surficial deposits are probably made up largely of sand. Glacial deposits elsewhere in Alberta and Saskatchewan where the Athabasca sandstone forms bedrock is very sandy, much of the sand having been derived from the Athabasca sandstone itself. Hobson and MacAulay (1969) reported glacial drift thicknesses usually less than 60 feet in the area of the reconnaissance seismic survey undertaken by the G.S.C.

Structure

The Old Fort River project area lies entirely within the Canadian Shield structural province. Regionally the Athabasca sandstone of Proterozoic age is flat-lying to gently dipping and unconformably overlies the Archean basement complex. However, local structural detail is lacking because bedrock is covered by a veneer of glacial drift, and outcrops are rare. Although the Athabasca sandstone regionally is flat-lying to gently tilted, steep dips have been reported locally and have been attributed to fault movements in basement rocks (Fahrig, 1961). Hobson and MacAulay (1969) suggested that the Athabasca sandstone was layed down on an irregular basement complex whose topography was controlled by a series of southwesterly trending horsts and grabens.

Examination of regional geologic and aeromagnetic maps indicates that dominant structural trend in basement rocks is southwesterly. However, a northwesterly grain intercepts it immediately northeast of the Old Fort River.

Although it is anticipated that the Athabasca sandstone will be essentially flat-lying in the project area, the photogeologic study was unable to verify this concept because of a lack of outcrops. However, the topographic expression of the mantled surface suggests essentially horizontal bedrock.

Several distinctive alignments were noted during the evaluation. Most alignments can be attributed to glaciation or wind action. However, a series of southwesterly trending alignments in Tp. 111, R. 1 W4M, may be reflecting a basement fault trend. Moreover, the linear northeasterly trending segments of the Old Fort River valley in Tps. 109, R. 2 and 3, W4M. may be structurally controlled reflecting the basement grain indicated in that area by aeromagnetic data. The straight, southeasterly trending shore of Lake Athabasca present in the northern part of the Old Fort River area has been suggested to be fault controlled by Hobson and MacAulay, (1969).

Respectfully submitted,

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[redacted]

George M. Collins, P. Geol.

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Alberta Government

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